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IS : 9052 - 1978
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Indian Standard

CODE OF SAFETY FOR ALUMINIUM CHLORIDE, ANHYDROUS

UDC 661.862.321 : 614.8

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INDIAN STANDARDS INSTITUTION
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

Gr. 3

***June* 1979**

AMENDMENT NO. 1 DECEMBER 2006
TO
IS 9052 : 1978 CODE OF SAFETY FOR ALUMINIUM CHLORIDE, ANHYDROUS

(Page 4, *clause* 3) — Insert the following new clause at the beginning and renumber the subsequent clause:

'3.1 General Information

a) Molecular formula : $AlCl_3$
b) Molecular weight : 133.34
c) CAS No. : 7446-70-0
d) UN No. : 1726'

(Page 5. *clause* **4.1.3)** — Insert the following at the end:

'Animal studies show that aluminium chloride may cause possible reproductive hazard — may cause fetotoxic and embryotoxic effects. The TLV as recommended by American Conference of Governmental Industrial Hygienists (ACGIH) is 2 mg/m^3, as Aluminium.'

(Page 6, *clause* **6.1.3)** — Insert the following new clause after **6.1.3:**

'6.2 Incompatibles — Water can react violently with anhydrous aluminium chloride to release corrosive hydrogen chloride.

Strong oxidizing agents can react vigorously.

Alkali metals (potassium or sodium) — produce strong explosion on impact.

Nitrobenzene or nitromethane mixtures are thermally unstable and may lead to explosive decomposition.

Polymerizable materials, for example, monomers such as ethylene, ethylene oxide, isobutene or allyl chloride) can polymerize or react violently.

Oxygen difluoride, phenyl azide, perchloryl benzene, perchloryl fluoride and benzene, sodium tetrahydroborate or strong bases can react explosively.

Mixture of benzoyl chloride and naphthalene, mixture of aniline and ethyleneimine or mixture of sodium peroxide and aluminium - violent exothermic reactions can occur upon contact.

(CHD 8)

Reprography Unit, BIS, New Delhi, India

Indian Standard

CODE OF SAFETY FOR ALUMINIUM CHLORIDE, ANHYDROUS

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(*Continued on page* 2)

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(*Continued on page* 9)

Indian Standard

CODE OF SAFETY FOR ALUMINIUM CHLORIDE, ANHYDROUS

0. FOREWORD

0.1 This Indian Standard was adopted by the Indian Standards Institution on 30 December 1978, after the draft finalized by the Chemical Hazards Sectional Committee had been approved by the Chemical Division Council.

0.2 Aluminium chloride is used as a catalyst in Friedel-Craft's reaction, and in the manufacture of synthetic rubber, lubricants, dyes, ion exchange resins, etc.

0.3 This standard is intended to guide the users in the recognition of hazards and in establishing safe handling procedures as aluminium chloride reacts violently with moisture, generating heat and evolving hydrogen chloride vapour. On contact with skin or eyes, it may cause severe thermal and acid burns.

0.4 The properties given in **3.1** pertain to pure anhydrous aluminium chloride and have been included for information only.

0.5 In the preparation of this standard, assistance has been derived from Safety Data Sheet No. SD-62 'Aluminium chloride', issued by the Manufacturing Chemists Association, USA.

1. SCOPE

1.1 This standard describes properties of anhydrous aluminium chloride, nature of hazards associated with it and essential information on storage, handling, packing, labelling, disposal of waste, cleaning and repairing of containers, selection and training of personnel, personal protective equipment and first aid.

1.1.1 This code does not deal with specifications for design of buildings, chemical engineering plants and equipment for operations control and waste disposal.

2. TERMINOLOGY

2.1 For the purpose of this standard the definitions given in IS: 4155-1966* and IS : 4167-1966† shall apply.

3. PROPERTIES OF ANHYDROUS ALUMINIUM CHLORIDE

3.1 The important properties of anhydrous aluminium chloride are:

Colour — Orange to yellow through grey to white

Odour — Odour of hydrogen chloride

Reactivity — Vigorous exothermic reaction with water, liberating hydrogen chloride gas

Corrosivity — Anhydrous aluminium chloride is non-corrosive to steel or other commonly used metals. Contact with moisture creates a corrosive condition by forming hydrogen chloride and aluminium oxychloride

Boiling Point — 182.7°C at 752 mmHg pressure

Melting Point — 194°C at 2.5 atmospheres

Sublimation Point — 177 to 181°C at 1 atmosphere

Heat of Solution — 576 cal/g

Hygroscopicity — Hygroscopic

Density of Pure Solid — 2.44 g/cm^3 at 25°C

Solubility — Soluble in wide range of organic compounds, such as chloroform, carbon tetrachloride, absolute alcohol, ether and benzene.

4. HAZARDS ASSOCIATED WITH ANHYDROUS ALUMINIUM CHLORIDE

4.1 Health Hazards

4.1.1 *General* — On contact with moisture, a violent reaction occurs and heat is produced resulting in severe thermal burns. An acid burn may also result because of the formation of appreciable amounts of hydrogen chloride vapour. In absence of moisture it may cause minor skin irritation. It may act as a sensitizer and produce contact dermatitis.

4.1.2 *Acute Toxicity* — No systemic effects are recognized. Locally the damage is limited to thermal and acid burns. Ingestion is most unlikely. If it occurs, immediate local reaction would cause severe burns not dependent on any toxic action. It may act as a gastric irritant causing nausea and vomitting and in severe cases, purging.

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*Glossary of terms relating to chemical and radiation hazards and hazardous chemicals.

†Glossary of terms relating to air pollution.

4.1.3 *Chronic Toxicity* — No form of chronic toxicity has been recognized, either systemic or local.

4.2 Fire Hazards

4.2.1 Anhydrous aluminium chloride is not explosive or flammable, but a violent reaction results if a stream of water is directed against large quantities of it.

4.2.2 In case of fire in an area where aluminium chloride is stored, the containers should be covered with asbestos blankets.

5. PACKAGING AND LABELLING

5.1 Packaging — Aluminium chloride should be packed in double bags of polythene/polyvinyl chloride (PVC) and then in tins or directly in resin coated or rubber lined containers.

5.2 Labelling — The containers should bear the label given in Fig. 8 of IS: 1260 (Part I)-1973*. The lower half of the label should bear the following words printed in addition to or in combination with any other words required by statutes, regulations or ordinance:

ALUMINIUM CHLORIDE
CORROSIVE SOLID, IRRITATING TO SKIN
WASH SPILLAGE WITH AMPLE WATER
REMOVE LEAKING DRUMS TO WELL-VENTILATED PLACE
KEEP AWAY FROM FIRE AND WATER
STORE IN A COOL DRY PLACE

5.2.1 In addition, each container should have the words 'KEEP DRY' stencilled or imprinted on the cover.

NOTE — Containers provided with screw vents should have the words 'VENT BEFORE OPENING ' stencilled on the cover.

6. STORAGE

6.1 Conditions of Storage

6.1.1 No special type of storage construction is necessary. Drums should be placed in cool, dry areas protected from direct sunshine and rain.

6.1.2 Aluminium chloride should be stored out of contact with moisture in tightly closed steel containers. Seams of steel drums used for storing aluminium chloride should be welded, or a waterproofing compound should be used to make it impervious to water. The cover should be fitted with a rubber ring. It should not be stored in buildings where sprinkler systems are in operation.

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*Pictorial marking for handling and labelling of goods: Part I Dangerous goods (*first revision*).

6.1.3 Good natural ventilation is enough.

7. HANDLING

7.1 Spills and Leakage

7.1.1 Frequent equipment and container inspections should be made to detect or prevent leaks.

7.1.2 If large spills occur, as much as possible of the aluminium chloride should be shovelled or scooped up. The remainder should then be flooded and washed down with plentiful supply of water. Personal protective equipment should be worn.

7.1.3 A leaking container should be taken to an isolated dry place where its contents should be transferred to a sound container.

7.1.4 For destruction of spills of aluminium chloride in a plant, it should be covered with sodium bicarbonate, flushed with water and drained into sewerage.

7.2 Disposal and Return Precautions

7.2.1 Most containers are non-returnable. Returnable drums to be refilled should be tightly closed after emptying to avoid contamination caused by the introduction of atmospheric moisture.

7.2.2 Empty containers for discard should be rinsed with water for disposal.

7.3 Unloading and Emptying Containers

7.3.1 Handle carefully to prevent leaks and exposure to atmospheric moisture.

7.3.2 Loosen the vent-screw or open carefully as there is always slight pressure in the container.

7.3.3 Prevent dusting and provide adequate ventilation.

7.3.4 Personal protective equipment should be worn, if exposure warrants it.

8. EMPLOYEE EDUCATION AND TRAINING

8.1 Enlist co-operation of the employees in safety programme thus making engineering and medical controls more effective.

8.2 Employees should know:

a) potential hazards and handling procedures,

b) the purpose, use and maintenance of personal protective equipment,

c) location of eye fountains and safety showers, and

d) first-aid in emergency.

They should promptly report any leaks, equipment failures, signs of illness or any skin effects.

9. PERSONAL PROTECTIVE EQUIPMENT

9.1 Eye Protection

9.1.1 *Chemical Safety Goggles* — Cup type of rubber-framed goggles equipped with approved impact-resistant glass or plastic lenses should be worn whenever there is danger of aluminium chloride coming in contact with eyes. In summer, the goggles should be bordered with cloth to absorb any chemical laden perspiration that might enter the eyes.

9.1.2 *Face Shields* — Plastics shields (full length, 200 mm minimum) with forehead protection should be worn in lieu of, or in addition to, chemical safety goggles where complete face protection is desirable.

9.2 Respiratory Protection

9.2.1 Industrial canister type gas masks fitted with proper canister for absorbing hydrogen chloride vapour (gas) and equipped with full face-pieces, afford protection against concentrations not exceeding 2 percent by volume. The oxygen content of the air should be not less than 16 percent by volume. The mask should be used for short exposures only. The wearer should be warned to leave the contaminated area on detecting the odour of hydrogen chloride.

9.2.2 Dust respirator with suitable filters for the removal of both dust particles and acid gases is recommended.

9.3 Head Protection — Brimmed felt hats to prevent dust from settling in the hair or scalp.

9.4 Foot Protection — Leather or rubber safety shoes.

9.5 Body Skin and Hand Protection

9.5.1 Rubber gloves should be worn to protect the hands from aluminium chloride.

9.5.2 Rubber aprons should be worn to protect clothing.

9.5.3 Contaminated clothing shall be removed immediately and washed before re-use.

9.5.4 Lanolin application on nostrils is beneficial where dust concentrations are low.

9.5.5 Daily personal showers at the close of work for workers exposed to aluminium chloride cannot be over emphasized.

9.5.6 Application of barrier creams is beneficial.

10. VENTILATION

10.1 Good natural ventilation is sufficient where aluminium chloride is handled in small containers.

10.2 Any location where aluminium chloride dust creates a problem, such as in packing and unloading areas, should be equipped with a mechanical exhaust system, wherein possible ventilation should be provided at floor level.

11. FIRST AID

11.1 Specific Actions

11.1.1 *Contact with Skin and Mucous Membranes* — Body areas that have been in contact with aluminium chloride should be flushed with water without undue delay. Prolonged washing with water is better than attempting to neutralize with chemical agents. Clothing penetrated by the chemical should be removed promptly. A physician should be consulted for all cases other than minor burns.

11.1.2 *Contact with Eyes* — Immediately after contact, eyes should be flushed thoroughly with water for a minimum of 15 minutes. Eye Jids should be held apart during irrigation to ensure contact of water with the entire surfaces of the eyes and lids.

11.1.2.1 A physician should be consulted without delay, preferably an eye specialist. Ointments should not be used except as directed by a physician.

(*Continued from page 2*)

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INTERNATIONAL SYSTEM OF UNITS (SI UNITS)

Base Units

Quantity	*Unit*	*Symbol*
Length	metre	m
Mass	kilogram	kg
Time	second	s
Electric current	ampere	A
Thermodynamic temperature	kelvin	K
Luminous intensity	candela	cd
Amount of substance	mole	mol

Supplementary Units

Quantity	*Unit*	*Symbol*
Plane angle	radian	rad
Solid angle	steradian	sr

Derived Units

Quantity	*Unit*	*Symbol*	*Conversion*
Force	newton	N	1 N = 0.101 972 kgf
Energy	joule	J	1 J = 1 N.m
Power	watt	W	1 W = 1 J/s
Flux	weber	Wb	1 Wb = 1 V.s
Flux density	tesla	T	1 T = 1 Wb/m^2
Frequency	hertz	Hz	1 Hz = 1 c/s (s^{-1})
Electric conductance	siemens	S	1 S = 1 A/V
Pressure, stress	pascal	Pa	1 Pa = 1 N/m^2